

own preferences. The absence of answers makes the book of no use to the private student who requires some check on the work he does. On the whole, we think that the utility of the book would be increased by the addition of these; or, if this is not favoured, then by their publication in a separate volume.

The whole ground of physics is covered, including mechanics. The general difficulty is only slight. By far the largest number of the problems could be tackled by a first-year university student. In mechanics very many are even of matriculation standard; thus, "The Washington Monument is 169 metres high. In what time will a stone fall from top to bottom?" Mingled with these are a few requiring the calculus. Many require only a qualitative answer; thus, "Explain why it is difficult to walk up an icy hill." These remarks are equally true of the other sections; thus, in electricity, the following is a commonly occurring type of question:—"Two copper wires are of the same cross-section, but one is twice as long as the other. Compare their resistances." Indeed, this question illustrates the general character of the book very well. Take each clause of an ordinary text-book and express it in question form—that seems to have been the mode of formation. We miss the bright sparkle of genius which flashes out from the examination papers of many of the examiners that we know. Still, we think, and we have said, that many will find it a very useful book.

Turning next to the hints, which, we think, might be multiplied with advantage, these are not always above criticism. Take, for example, the following:—

"Prove that a gun free to move backward and the bullet fired from it have the same momentum when the bullet leaves the gun. Note: Action and reaction are equal and opposite. Force on gun = force on bullet.

$$M_g A_g = M_b A_b \quad [A = \text{acceleration}]$$

Multiply by t

$$M_g V_g = M_b V_b."$$

We are of opinion that equality of the two momenta is the fundamental fact which can be proved only by experiment. The operation of changing from a variable acceleration to the change in velocity is inadequately represented by a multiplication by the time.

The arrangement of the problems seems to have been imperfectly attended to; very many questions are to be found in sections with which they have nothing to do. For example, under the head "Colour" occur a series of questions such as "Why does an object appear equally bright at all distances from the eye?"

A series of useful tables completes the volume. The numerical constants given are not always scrupulously exact. For example, $\log \pi = 0.497150$ and not 0.497149 (as given) when only six figures are to be retained. Again, why should a student (or teacher) be misled into taking $\log \pi^2$ as 0.994299 when the much simpler number 0.994300 is more exact? There are two other examples of this on the same page. This is the kind of number which, if quoted at all, ought to be checked and re-checked until the author is sure that he has it right.

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MATHEMATICAL METAPHYSICS.

Principien der Metaphysik. By Dr. Branislav Petronievs. Vol. i., part i. Pp. xxxi+444. (Heidelberg: Carl Winter, 1904.) Price 15 marks.

THIS is the first instalment of a new work on metaphysics. It discusses only general ontology and the formal categories (in other words, the general ontological and the quantitative problem). The second part of the same volume, we are informed, will deal with the qualitative and hyper-metaphysical problems, and the second volume will then go on to cosmology and psychology.

The author's guiding principle is expressed in the motto, "Correct mathematical ideas are the key for the solution of the riddle of the universe." We doubt if this will command the acceptance of any metaphysicians whose interests are not primarily mathematical. Mr. Balfour, in a well-known passage, has pointed out how often the battles of theology are decided beyond the borders of that study; it is a little hard if the metaphysician, who contemplates all time and all existence, is to be fettered by the geometrical views of his age, and before he makes any headway in *prima philosophia* must study closely the hundred-page account of the new geometry "with 3 tables containing 56 geometrical figures."

We doubt in particular whether ordinary metaphysicians will ever accept the "discrete" or atomic view of space here given, however fashionable it may be among modern mathematicians. That view goes back to the Arabic school of the Mutakallimūn. Dr. Petronievs adopts, with some slight differences, the development of the theory advocated by Giordano Bruno. He distinguishes two kinds of "point," *Mittelpunkt* (der reale mit Inhalt erfüllte Punkt) and *Zwischenpunkt* (der irrealen die leere nichtseiende Lücke darstellende Punkt). The discussion of time follows the same atomic lines. The plain man wonders in what fashion precisely his old friend "Achilles and the tortoise" is to be dealt with on these principles. (That fallacy, it is true, appeals in the first instance to those who combine an atomic view of Time with a non-atomic view of Space, but it has surely its difficulties for any who regard either Time or Space as discrete.) The same guileless innocent, while understanding readily the general data which enable a Kelvin to calculate the approximate size of "atoms" of water, does not see quite so readily how we can ever hope to reach the data for determining the size of atoms of impalpable Time or Space. Nor, again, does he see the special benefit of abolishing the old Euclidean point in favour of the new one endowed with both position and magnitude, when to all intents he is compelled, a moment later, to revive in the term *Zwischenpunkt* the "point" of his earliest geometrical affections—"that which has position but not magnitude"; and he recalls the Horatian tag, "*Expelles furca, tamen usque recurret.*"

Still, the discussion contained in this volume is stimulating, and considerable dialectic power is displayed. One will watch with interest in the later volumes whether the author succeeds in dealing with

his various problems without always recurring to the mathematical point of view. Unfortunately, one word must be said regarding the typography. The present reviewer has seldom read a book so badly corrected for the press. There are two pages of corrigenda; but a full statement of all the small misprints would with difficulty be contained in four or five pages more. If it is not *c* for *o* or *e*, it is *u* for *n*, or *l* for *t*, or *b* for *h*, or *das* for *dass*. This is the more to be regretted because—granted the author's point of view—the *i*'s of the philosophy are quite carefully dotted.

BRITISH MINERALS.

A Handbook to a Collection of the Minerals of the British Islands in the Museum of Practical Geology.

By F. W. Rudler, I.S.O. Pp. x+241. (London: H.M. Stationery Office, 1905.) Price 1s.

SINCE his retirement from the post he so long and efficiently held as curator of the Museum of Practical Geology, Mr Rudler has installed in that museum a collection illustrative of the modes of occurrence of British minerals. The museum has long possessed collections of British rocks, fossils, and ores, the last named arranged under the various metals which they contain. In the new collection, which is neatly arranged in twelve table-cases, the minerals found in each district are brought together; half the space is allotted to Cornwall and Devon, one-eighth to Scotland, Ireland, and the Isle of Man, and the remainder to the rest of England, the divisions being roughly according to the several mining districts, with a general group for the minerals of the Neozoic strata. The specimens, to the number of 1652, have mostly been selected from the Ludlam collection, which was bequeathed to the museum in 1880; though mostly small in size, they are of excellent quality. In addition to the name and locality attached to each specimen, there are many explanatory labels in the cases, and the present volume admirably serves the purpose of a guide to the collection.

The volume is by no means a tedious catalogue or descriptive list of all the individual specimens, but is rather an extremely readable and interesting account of the mode of occurrence and history of the more common British minerals, especially those which are of economic importance. Instead of long descriptions of the characters of species, much is said of their paragenetic relations, and many valuable suggestions are made as to their possible modes of origin. The book will therefore be found interesting and instructive not only to mineralogists, but also to geologists and miners; whilst quite apart from the collection, for which it is primarily intended, it will have a permanent value as a treatise. In this connection mention may be made of the numerous and extremely valuable references to original authorities consulted in the preparation of the work.

The mode of treatment is a novel one, and necessarily involves a certain amount of repetition, especially in the case of some of the more commonly

occurring minerals, such as quartz, calcite, galena, &c., which may be found in almost all the different districts; but this repetition is not tedious. As an example, the district of Cornwall and Devon may be taken, in which the main groups are as follows:—cassiterite, minerals associated with cassiterite, copper sulphides and sulpho-ferrites, copper-bearing minerals of the gozzans, arsenates and phosphates of the copper-gozzans, ores of lead, zinc, antimony, &c., sulphides and sulpho-salts, ores of iron, &c., minerals of the rarer metals, the spars of the mineral veins, miscellaneous minerals.

Apart from a few minor misprints, the only point which calls for criticism is that undue importance seems to have been attached to many quite trivial and local names. As for the printing, there is certainly much room for improvement; the lines are so badly broken that it is surprising that the whole did not fall to pieces in the course of printing.

L. J. S.

OUR BOOK SHELF.

Moths and Butterflies. By Mary C. Dickerson. Pp. xviii+344; with 200 photographs from life by the author. (Boston, U.S.A., and London: Ginn and Co., n.d.) Price 5s. net.

THIS is a prettily got-up book, intended for the training of classes in "nature-study," with reference to a considerable number of common and conspicuous North American butterflies and moths, the life-history of which is very fully described and illustrated. The concluding chapter, on collecting, keeping, and studying, recapitulates the points to be noted in practical observations on the insects themselves.

To English readers the book will be useful for the information it supplies about American forms, and also as indicating a similar method of study for British insects, but many of the species here noticed are much larger and more conspicuous than those likely to fall under our own observation, among them being several species of *Papilio*, and large *Saturniidae*.

The figures, of which (including apparatus, &c.) there are 233 in all, are generally very good, though some are indistinct. The frontispiece, representing a *Smerinthus* at rest, and Fig. 17, on p. 147, representing a procession of the young caterpillars of *Saturnia*, may be specially noticed. But it looks odd to see a *Smerinthus* closely allied to our own *S. ocellatus* called "a most beautiful little moth" (p. 232); and, though we do not object to the use of appropriate English names, we are sorry to see on p. 231 a *Sphinx* allied to *S. convolvuli* called "the Humming-Bird Hawkmoth," a name by which the very different *Macroglossa stellatarum* has been known all the world over, ever since the commencement of the study of entomology.

We had expected to find some notice of the gipsy moth, the crusade against which has recently been given up in America in despair, but find only a passing reference. A few British species are noticed, such as *Vanessa antiopa*, called in America the mourning cloak, a translation of its German name; *V. atalanta*, *Pieris rapae*, &c.

A great deal of useful general information is given in the book, and it seems on the whole to be careful and accurate. One statement, however true in the abstract, ought not to have been made without qualification or explanation in a popular book. On p. 267 we read, "We are familiar with the fact that all living